

Docket No.: 285507US0PCT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:

GROUP: 1794

Tadaaki KANEKO, et al.

SERIAL NO: 10/566,652

EXAMINER: LANGMAN, JONATHAN C

FILED: June 28, 2006

FOR: TANTALUM CARBIDE, METHOD FOR PRODUCING TANTALUM CARBIDE, TANTALUM CARBIDE WIRING AND TANTALUM CARBIDE ELECTRODE

DECLARATION UNDER 37 C.F.R. § 1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

Sir:

Now comes Satomi TORIMI who deposes and states that:

1. I am a graduate of Graduate School of Kwansei Gakuin University and received my Master's degree in the year 2008.
2. I have been employed by Toyo Tanso Co. LTD for 2 years and 3 months as an assistant researcher.
3. I am familiar with the above-captioned patent application, of which Toyo Tanso Co. LTD is the assignee.
4. I have reviewed and understood the Office Action dated January 15, 2010 and I have read and understood the contents of Douglass et al (US 3,163,563, US'563), Lopez et al (US 5,916,377, US'377), Murakami et al (US 5,973,400, US'400) and Garg et al (US 5,126,206, US'206).
5. The following experiments were carried out by me or under my direct supervision and control.

a) An inventive Tantalum Carbide material according to Claim 8 of the above-captioned patent application and a comparative material according to US'563 were prepared. The detailed experimental conditions are shown in Table 1 below.

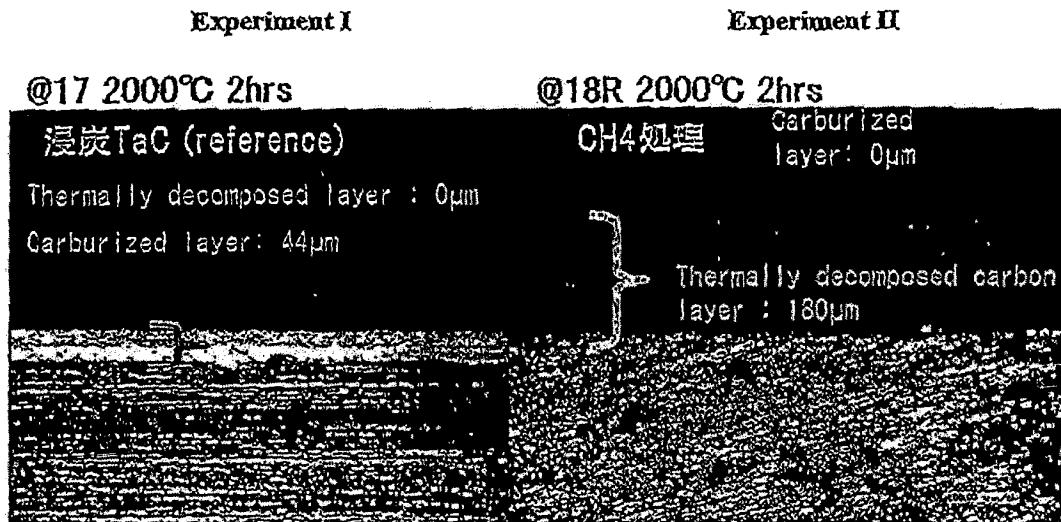
Table 1

| | Carburization Temperature (°C) | Qty. of CH ₄ gas | Carburization period (h.) | Pressure (Torr) |
|--------------------------------------|--------------------------------|-----------------------------|---------------------------|-----------------|
| The present invention (Experiment I) | 2000 | Carbon flux used | 2 | 30 |
| Reference 1 as disclosed in US'563 | 2300 or 2500 | 566 L/min. | 1/2 to 29/4 | 20 to 50 |
| Reference 1 (Experiment II) | 2000 | 1 L/min. | 2 | 30 |

In Experiment I, a Ta substrate was subjected to carburization under conditions as in Example 1 of the present application as the conditions are further shown in Table 1. In Experiment II, a Ta substrate was subjected to carburization under conditions as in Table 1 of US'563 as the conditions are further shown in Table 1. Please note that the carburization temperature in Experiment II was set at 2000 °C which was lower than 2300 or 2500 °C in US'563 for comparison purposes. Additional conditions under which Experiment II was conducted are found in US'563, including a carburization period, a constant methane flow rate of about 20 cubic feet per minute, a methane pressure of 20-30 mm.pressure, a carbon crucible for carburization, and a methane gas supplied before raising a temperature. In Experiment I and Experiment II, the Ta substrates were carburized after oxide films were completely removed. In Experiment II, the carburization was conducted at 2000 °C where no carbon source other than CH₄ was supplied.

b) Cross section views of the substrates in Experiment I and Experiment II after carburization are shown in Figure 1 below. In Experiment I, a surface of the tantalum alloy substrate was carburized and a TaC layer and a Ta₂C layer were formed on the surface of the tantalum alloy substrate. In Experiment II, a surface of the tantalum alloy substrate was not carburized and a thermally decomposed carbon was deposited on the surface of the surface of the tantalum alloy substrate where the thermally decomposed carbon was produced when methane was thermally decomposed. Therefore, Experiment II failed to obtain a TaC layer on a surface of a tantalum alloy by carburization. In US'563, carburization is conducted by placing a tantalum substrate in a carbon melting pot. It is therefore believed that carbon of the carbon melting pot serves as a carbon source for carburizing the tantalum substrate. However, as shown in Experiment II, during carburization, the thermally decomposed carbon was deposited on the tantalum substrate before a carbon flux was generated from the carbon melting pot and consequently a tantalum carbide material as claimed in the above-captioned patent application was not obtained. As is evident from the experimental results in Table 1 and Figure 1, the tantalum material obtained by the method of US'563, would not form a TaC layer on a substrate of a tantalum or tantalum alloy substrate as in Claim 8. It is my opinion, based on the examples above and the examples of the specification, that a tantalum carbide material of the above-captioned patent application as shown in Experiment I should not have been foreseen based on the disclosure of US'563.

Figure 1



6. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Satoshi Toriumi
Signature

15. 7. 2010
Date

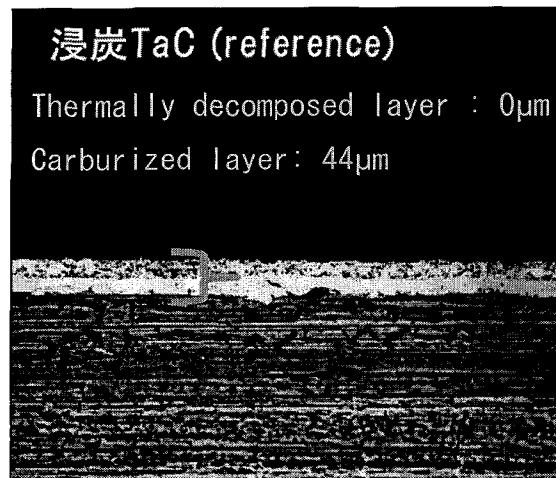
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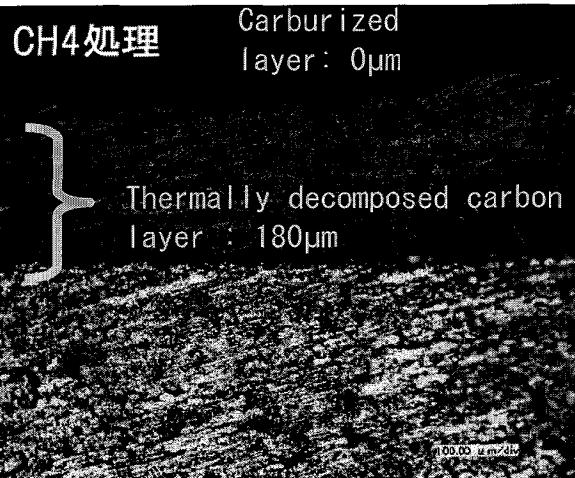
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Figure 1

Experiment I



Experiment II



6. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

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